

Microsoft exFAT by Tuxera

The go-to choice for exFAT support

Our commercial-grade file system implementation, Microsoft exFAT by Tuxera, adds external storage support for USB drives and SD™ memory cards larger than 32 GB to any device. The leading OEMs, ODMs, car makers, and Tier-1 suppliers choose Microsoft exFAT by Tuxera for fast, seamless data transfers in the latest consumer electronics and smart cars.

Developed to the highest standards

Microsoft exFAT by Tuxera brings plug-and-play support for high-capacity flash storage including USB drives, external HDD/SSD, and all types of SD memory cards including SD™, SDHC™, SDXC™, microSD™, microSDHC™, and microSDXC™. It's designed for when you need the highest reliability, performance, and customizability in an exFAT® implementation.

Our commercial exFAT solution is based on Microsoft and SD Association specifications. Tuxera is a board member of the SD Association, and we're also the main driver behind SDXC adoption, an international standard for high-capacity SD memory cards. The SD Association specifies exFAT as the standard to use for removable media. Microsoft exFAT by Tuxera goes beyond these baseline requirements with implementation options that improve reliability, lifetime, and performance of the storage media.

GENERAL FEATURES

Supported operating system	Android, Linux, Chrome OS, Firefox OS, Tizen, QNX, and Nucleus
Hardware architectures	<ul style="list-style-type: none">• ARM, ARM64, Intel x86/x86_64 or compatible, MIPS, MIPS64, PowerPC, SH4, and more• Confirms to all Microsoft exFAT versions including XP, Vista, Windows 7, Windows 8 and Windows 10 (Microsoft Interop Vendor Alliance)• Conforms to SD Association (SDA) specifications• Support for all flash-based storage types such as SD cards, eSD, CF cards, SSD, USB-connected storages, SATA, eSATA, FireWire, and eMMC• Support for APM, GPT, and MBR partition schemes
Capacity	<p>Maximum volume size: 128 PiB</p> <p>Minimum cluster size: 512 bytes</p> <p>Maximum cluster size: 32 MiB</p> <p>Maximum file size: 128 PiB*</p> <p>Maximum number of entries per directory: 2,796,202</p> <p>Maximum filename length: up to 255 characters</p> <p>Supported sector sizes: 512, 1024, 2048, and 4096 bytes</p> <p>*The operating system and hardware platform may place additional limits on maximum file size, e.g. Linux on 32-bit platforms limits the maximum file size to 8 TiB with 4 KiB page size, and 128 TiB with 64 KiB page size.</p>

SYSTEM REQUIREMENTS

Minimum system requirements	1 MiB of RAM Processor: 25 MHz
Memory and CPU footprint	Read-write: 70-90 KiB Read-only: 40-60 KiB CPU: 0-10%

PROPRIETARY FILE SYSTEM FEATURES

Power-safe / fail-safe	Volume consistency ensured if storage is removed, or power or battery is disconnected
Tuxera POSIX test suite	Tuxera maintains POSIX File System Test Suite. The following systems are tested: <ul style="list-style-type: none">• chmod: changes permission• chown: changes ownership• mkdir: creates directories• open: opens a file• rename: changes file name• rmdir: removes directories• truncate: decreases/increases file size• unlink: removes regular files, symbolic links, fifos, and sockets
Free space bitmaps	Microsoft exFAT by Tuxera uses free space bitmaps to reduce fragmentation and to improve space allocation when files are deleted.
Windows filename compatibility	Unicode Character Set (UTF-16). Exceptions: U+0000 (NUL) through U+001F (US), / (slash), \ (backslash), : (colon), * (asterisk), ? (question mark), " (quote), < (less than), > (greater than), and (pipe). Unicode fulfills the need to support character differences in national and regional languages (Japanese, Korean, Chinese, Western, etc.).
OEM parameters	OEM Parameters Sector for device-dependent parameters
UTC timestamps	Support for Universal Coordinated Time (UTC) timestamps

Cutting edge fail safety & performance

Unexpected power interruption can cause data loss or damage device hardware. Microsoft exFAT by Tuxera makes sure your files are stored safe and sound. It goes beyond other alternatives to bring you volume check and repair tools to ensure file system consistency, fix corrupted volumes, and recover lost files. These tools have both runtime and idle time components, allowing rapid recovery and mount time where necessary.

Through intelligent write ordering, Microsoft exFAT by Tuxera reduces orphaned clusters and other problems that require chkdsk and user intervention to properly correct.

Writes are performed in an atomic fashion, so that only blocks of complete data are written to the media.

Optimal caching aligns well with the flash media requirements. The delayed metadata updates minimize the write amplification, resulting in the longest possible lifetime from inherently short-lived NAND flash.

The techniques which increase lifetime often increase performance, and Microsoft exFAT by Tuxera goes beyond that with excellent scalability for large media cluster size.

PERFORMANCE AND RELIABILITY

High performance	<p>Active superblock (FAT), file, directory, attribute, and data caching. Advanced algorithms and data structures ensure maximum I/O throughput, low CPU usage for small and large files, and achieve high IOPS for file operations. Tunable settings. Low power use optimized for increased battery life.</p> <p>Free area management: allocation bitmap</p> <p>Cluster chain management:</p> <ul style="list-style-type: none">• FAT chain• Directory entry• FAT + continuous information <p>Name Search: comparison of name hash</p> <p>When saving files to SDXC cards, full speed can be achieved</p> <p>Zero-copy support (direct I/O)</p> <p>No data fragmentation</p>
Reliability	<p>Rigorous quality assurance, wide deployment, and fault-tolerant design guarantee outstanding file system robustness</p>

Easy Microsoft exFAT patent licensing

Tuxera has been a Microsoft partner since 2009 – and their first file system partner. We're also a part of the Microsoft exFAT licensing program. With our special arrangement with Microsoft, you can purchase our proprietary exFAT file system implementation, already covered by a full Microsoft exFAT patent license. This means you can get fully legal exFAT at a smart bundle price, with no hassle – helping you achieve a faster time to market.

Customizable for your unique environment

Microsoft exFAT by Tuxera balances its reliability and fail safety with flexibility. Our team of experts is ready to optimize our file system implementation according to your use case – ensuring you get the most out of everything Microsoft exFAT by Tuxera has to offer.

LICENSING AND MAINTENANCE

Customization and maintenance	<p>Provides maintenance services so exFAT development can be safely customized using:</p> <ul style="list-style-type: none">• Product answers to inquiries• Minor version product available <p>Microsoft exFAT by Tuxera can be custom-adapted to any software</p>
Licensing	<p>Proprietary, commercial</p> <p>Note! Tuxera licenses the exFAT software implementation. Tuxera has a patent coverage from Microsoft that covers development and exFAT evaluation. The end customer distributing a product that incorporates exFAT must obtain a patent distribution license from Microsoft.</p>

Maximum data transfer speeds

With Microsoft exFAT by Tuxera, you get the maximum I/O throughput out of any device. Plus, our software reliably handles simultaneous recording, viewing, and uploading of several ultra-HD streams – even in embedded environments with limited resources.

Strong interoperability

Microsoft's own partner program also plays an important role in the expansion of exFAT for a wider ecosystem. Tuxera has been a trusted member of that global community since 2009 – helping to connect developers to the tools and resources that they need. This long-standing cooperation on business, technical, and legal aspects ensures we deploy Windows-compatible file systems on any platform.

Full service tech support

Our customer-focused software team is committed to supporting your project from design to production and beyond. Part of that support starts at the very beginning – Tuxera holds an executive position on the SD Association board of directors. We help with key design and development choices for this removable media, giving our professionals a deep understanding of exFAT technology.

■ **Interested?** Get in touch: sales@tuxera.com